A SIMPLE CONSTRUCTION OF WATER BATHS

By

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(Received June 1, 1963)

A simple principle for construction of constant temperature water baths without electricity is described.

Constant temperature water baths generally contain an immersed electrical heating arrangement with a thermostat for its control. Also in use are the simple type constant temperature baths heated by an electrical lamp or heating coil, which can be slid into and out of a metal pocket inside the water bath submerged at its bottom. Students jar baths used in various experimental laboratories are operated on this principle. In the method described here electricity is not required. The heating source is located away from the bath and the temperature is regulated by adjusting the heat applied at a distance.

The principle of the set up is diagrammatically represented in Fig. 1. A U-shaped circuit of water is arranged from the bath *W*, with glass tubes *G*, *G'* and *T*, and rubber connection tubes *R* and *R'*. The glass tube *T* (6 to 8 mm diameter) of one of the limbs of the circuit is bent as shown in the figure to provide surface for application of heat with a small flame *F*, from either a bunsen burner or a spirit lamp. The area of the glass tube which will be heated can be varied to include only its upper angle or more area on its oblique portion. The water which is warmed at this site rapidly courses up, drawing in its wake cold water from the bath. Thus a water circulation is set up, and warm water is added to the bath continuously in small quantities. The direction of the resulting water flow is indicated by arrows in the diagram and can be verified by adding methylene blue to the water bath and noting its course in the circuit.

If the glass tube *T* is of narrow diameter, water in the tube is heated rapidly and steam bubles are sometimes generated which will jerkily hasten the upward movement of water. Steam does not form readily if the glass tube is of a larger diameter and water flow is then continuous. The temperature of the bath rises slowly after heating is started. When the water in the bath reaches the desired temperature, the flame can be adjusted to maintain that temperature. The temperature achieved in the bath depends on

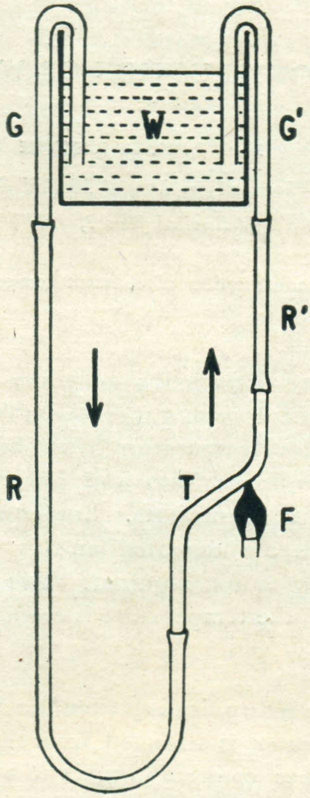

Fig. 1. Diagrammatic representation of a simple construction of water bath. *W*: water bath; *G*, *G'* and *T*: glass tubes; *R*, *R'* : rubber tube connections; *F*: flame from a burner.

a) the size of the bath to be heated b) its surface area for heat loss c) the room temperature and d) the amount of hot water that is being added by the circuit. Of these, the first three factors are not variable, while the last one can be regulated. The volume of hot water reaching the bath depends again a) on the volume of water getting heated at a time in tube *T*, and b) on the intensity of heat applied. The volume of water heated at a time can grossly be varied by using glass tubes of different diameters and also by replacing the glass bend with a glass spiral if larger area is required for heating. But fine adjustments of the temperature of the bath can be made quickly by regulating the intensity of heat applied to the tube either by adjusting the size of the flame or its distance from the glass tube.

This principle has been satisfactorily used in this laboratory to provide temperatures ranging from 34° to 37°C for students jar baths of 1 litre capacity in the Experimental Pharmacology practical classes. It has some advantages like ease of construction and negligible cost involved. With no heater or thermostat occupying space inside the bath in this method, more room is available in small baths. It also helps to convert any container with water into a constant temperature bath at times of necessity.
